REMARKS

The Office Action mailed on September 23, 2009, and the references cited therein have been received, and carefully considered.

Replacement drawing sheets for Figs. 1 to 5 are submitted herewith. It is believed that the new drawings are in full compliance with the rules. No new matter has been added.

Accordingly, it is submitted that the objection to the drawings has been overcome.

The rejection of claims 59-116 under 35 U.S.C. 112, second paragraph, is obviated by appropriate amendment.

Specifically, independent claims 59 and 92 have been amended to remove alternative language, and to address the antecedent basis problems noted by the Examiner. Claim 59 has been amended to recite a method step. Furthermore, claim 87 has been amended to refer to the drill-bit boss, which finds support in claim 59 upon which claim 87 depends.

In view of the above, it is believed that claims 59-116 now comply with the requirements of 35 U.S.C. 112, second paragraph, and the rejection should be favorably reconsidered and withdrawn.

Claims 59-64, 66-80, 82, 84, and 87-116 have been rejected under 35 U.S.C. 102(e) as being anticipated by MacGregor et al. (US 7,270,195). Furthermore, claims 83, 85, and 86 have been rejected under 35 U.S.C. 103(a) as being unpatentable over MacGregor et al.

The Applicants respectfully submit that the MacGregor et al. reference does not disclose or suggest Applicants' invention, as presently claimed. Reconsideration and allowance of the pending claims is therefore respectfully requested in view of the following remarks.

I. MacGregor on electrodes and their arrangement, and electro discharge gap control.

MacGregor et al. discloses an electrode arrangement consisting of two electrodes, one (high-voltage) central disc-shaped electrode and one outer cylindrical cage-like (ground) electrode with an annular gap between them of constant (radial) length. There is no mention that the electrodes are able to move freely, although the reference does indicate that there may be more than one pair of electrodes, and if so, they are arranged as concentric cylindrical end surfaces, all fixed in the plane corresponding to the face plane of the central disc electrode.

This rules out any conflict with the presently claimed invention regarding electrode concept, electrode construction, or electrode arrangement. All mention of electrode in the subject application refer to the detailed description of the invention, i.e. point electrodes with freedom to move in the direction of the borehole axis. The point electrode concept is an electrode with a minimum footprint on the hole bottom. The construction addresses how the freedom to move may be arranged, and the arrangement is about the placement of electrode gaps across the hole bottom.

Generally, the MacGregor reference shows no comprehension and does not attach any significance to the fact that the electrode configuration disclosed therein gives no control over the size or location of the electrode gap. The reference argues as if the gap is radially oriented, but on a random topography hole bottom any of the 2 electrodes (or any of the two electrodes constituting a pair if more than one pair) may be in contact with the hole bottom anywhere on the part of their surfaces which faces the hole bottom.

The electric discharge, therefore, choosing the path of least resistance (as MacGregor argues) may occur between surface segments far apart (if the discharge chooses to avoid

paths through the liquid) or may be along a radial path if the discharge chooses a path partly through rock and partly through liquid. Since the electrodes are not axially moveable, it may, of course, happen that one of them not touch the hole bottom at all.

MacGregor's lack of emphasis on this issue is confirmed by his elaborations on the movement over the hole bottom of the plasma-channel which constitutes a replica of the old Russian-formulated principle of "self-governing drilling progress" and " . . . with time through 360° . . . removing the material ahead of the electrode assembly and eliminating the requirement to rotate . . .". This adherence by MacGregor to the classical self-governing principle of electro discharge drilling proves a lack of understanding on the issue of discharge gap control.

In contrast, the present invention has the electrode system and the discharge control as its main issue. In order to achieve it, the fundamental condition is that all electrodes are "point electrodes", i.e. electrodes with a minimum footprint as they touch the hole bottom.

The control aspect exists at two levels, firstly by allowing individual freedom for all the electrodes to move axially. This rules out discharge partly through the fluid since all electrodes are in constant touch with the hole bottom, thereby ruling out the loss of excavating efficiency caused by discharge partly through the fluid.

Secondly, by adding manipulative means so that the axial freedom to move becomes a matter of systematic manipulation, for instance by computer control, the loss of efficiency is further reduced. As an example, if all but one electrode pair in a given moment are retracted, the full discharge energy is forced to occur at one predetermined electrode gap.

Sequential switching through all the gaps secures full hole bottom coverage at full efficiency for each pulse. These two levels of discharge control constitute the main thrust of

the present application. This clearly distinguishes the presently claimed subject matter from MacGregor (namely, point electrodes, individually movable, and individually steerable).

For the purpose of further qualifying the significance of the distinguishing feature, the following experimental work is referred to: In more than 100 series of experiments, it has been proven that identical pulses, when fed into fixed electrode self-governing bits, may excavate only 5-10% of the volume they excavate from the same material matrix when fed into one singular point electrode gap. This indicates the difference in drilling speed that may be expected. The distinguishing feature of the present application is therefore to be concluded as a most significant feature which moves the state of the art significantly forward.

II. MacGregor on pulse parameter format

MacGregor patents a pulse parameter range, notably a pulse voltage range, a pulse charge range, and a pulse power range. These three parameter ranges define the magnitude of MacGregor's electro discharge application. The MacGregor patent is not in conflict with the present claims on this issue.

The present claims are also directed to an electro discharge application of a certain magnitude. The related parameter ranges lie completely and entirely outside of the MacGregor ranges. The MacGregor magnitude constitute only 1‰ (or up to 1%) of the magnitude of the present invention, in terms of pulse power.

Regarding the inventive nature of the level of the parameter magnitude in the present application, in comparison, the MacGregor magnitude is like a miniature system. The pulse voltage constitutes 1%-10% of the pulse voltage of the present application, the pulse energy

1% - 2%, and the peak pulse power constitutes 1‰ – 1% of the peak pulse power of the present application.

The use of an electro discharge apparatus with peak pulse power of 1-10 GW in the present invention is thus a novel and materially different system from the MacGregor system, as it is up to one thousand times more powerful (on maximum power) than MacGregor's, i.e novelty following from magnitude.

MacGregor also covers other pulse characteristics, such as pulse rise time and waveform which are not in the subject of the present invention.

III. MacGregor on hydraulic and mechanical interaction in the drilling process

MacGregor does not mention the subject of hydraulic or other interactions in the drilling process.

What MacGregor contains is a description of an approximate flow regime on the hole bottom with main emphasis on the radial flow arrangements through the outer ring-shaped electrode. The focus concerns the electrode arrangement as a potential stopper to the circulation scheme and has nothing to do with excavation. Hole bottom crack structure or direction of flow jets to coincide with cracks or magnitude of flow energy are all foreign elements to MacGregor.

IV. MacGregor on deployment of the electric pulse generator

On the issue of the deployment of the electric pulse generator, both MacGregor and the present application contain deployment downhole, but with different emphasis and focus. MacGregor focuses on container concept ("cartridge") and tools for deployment ("coiled

tubing, drillpipe or wireline"), and the present application on proximity to the drill bit ("minimum fixed distance") and power supply ("1KV or other practical voltage").

Following from the parameter differences (discussed above), the two objects are also very different; one a miniature harboring only 1‰ or 1% of the power created by the other.

In these terms, and given that MacGregor has been granted a patent on a 1-100MW downhole pulse generator for up to 100mm diameter boreholes, it follows that the present invention is novel and unobvious over the art for a 1-10GW downhole pulse generator, the related diameters being 200-2000mm.

In summary, the presently claimed subject matter directed to the discharge application on the hole bottom in terms of point electrodes and control on the gap between electrodes and what gap to be served at any time, is novel and unobvious over the cited art. MacGregor has no point electrodes and no electrode gap control.

MacGregor patents a parameter range which constitutes a miniature of the presently claimed range, in terms of pulse power only 1‰ (or up to 1%). The present claims are also directed to a parameter range, which falls entirely outside of the MacGregor range, and therefore is in no conflict with it.

MacGregor contains nothing on the subject of hydraulic or other interaction in the drilling process. Thus, it is concluded that there is no interference or overlap between MacGregor and the present claims on these issues.

Novelty on the issue of down-hole pulse generators must be coupled to performance and hole sizes, the recognition being that high performances in small diameter boreholes qualify invention. In these terms, and given that MacGregor has been granted a patent on his 1-100 MW downhole pulse generator for up to 100 mm diameter boreholes in spite of

published old art, it follows that the present inventon is novel and unobvious regarding a 1-10 GW downhole pulse generator, the related diameters being 200-2000 mm.

In view of the foregoing remarks, Applicants respectfully submit that the rejections under 35 U.S.C. 102(e) and 103(a) are unsustainable, and urge favorable reconsideration and withdrawal thereof.

It is believed that the present application is now in condition for allowance, and an early allowance to this effect is respectfully urged. If any final points remain that can be clarified by telephone, Examiner Neuder is encouraged to contact Applicants' attorney at the number indicated below.

Applicants hereby petition the Commissioner for Patents to extend the time for reply to the notice dated September 23, 2009, for one (1) month from December 23, 2009, to January 23, 2010. A duly completed credit card authorization form is attached to effect payment of the extension fee.

Respectfully submitted,

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